CANADA/NOVA SCOTIA ACID RAIN REDUCTION AGREEMENT

Nova Scotia Department of the Environment
Report on the Year Ending March 31, 1989
Honourable John G. Leefe, Minister

June 30, 1989

Introduction

In February 1988 Nova Scotia signed an acid rain reduction agreement with Canada. The Agreement is part of a program undertaken by the seven eastern most Canadian provinces to control acid precipitation. The provinces, working on the hypothesis that deposition of wet sulphate to moderately sensitive areas should not exceed 20 kilograms per hectare, developed a plan of action to reduce emissions of sulphur dioxide (SO_2). The objective of the provinces is to reduce SO_2 emissions in eastern Canada to less than 2.3 million tonnes by 1994. The SO_2 reduction strategy adopted was based on a source-receptor, least-cost model. Thus emissions reductions were not divided evenly between the provinces. We in Nova Scotia set our 1994 objective at 204,000 tonnes of SO_2.

This report is the second annual review of Nova Scotia's initiatives in support of the Canada/Nova Scotia Acid Rain Reduction Agreement. It is designed briefly to discuss SO_2 emissions and to summarize current knowledge of acid rain deposition. It also comments on new initiatives from both management and research perspectives.

Emissions

Fossil fuel combustion produces over 90% of the emissions in Nova Scotia. Every oil furnace and diesel motor in the province vents SO_2 to the atmosphere in a collective amount that is estimated to range between 15,000 and 20,000 tonnes per year. The production of electrical power for homes and businesses across Nova Scotia however, leads to emissions of the major proportion of SO_2 in the provincial inventory. Figure 1 shows emissions from the Nova Scotia Power Corporation relative to their objective of 160,000 tonnes of SO_2 for 1994. The figure also shows trends in the fossil fueled generating capacity of the corporation and provides an estimate of total emissions of SO_2 in the province. Nova Scotia Power Corporation plans to add a pulverized coal furnace at Trenton in 1992, and expects to add three circulating fluidized bed furnaces shortly after.

In 1980, Nova Scotia Power Corporation emitted 122,000 tonnes of SO_2 from fossil fueled stations. In that year, 6,321 gigaWatt hours (GW.h (GW.h, 1 GW.h = 1,000,000 kiloWatt hours) of steam power were produced. In 2000 A.D.,

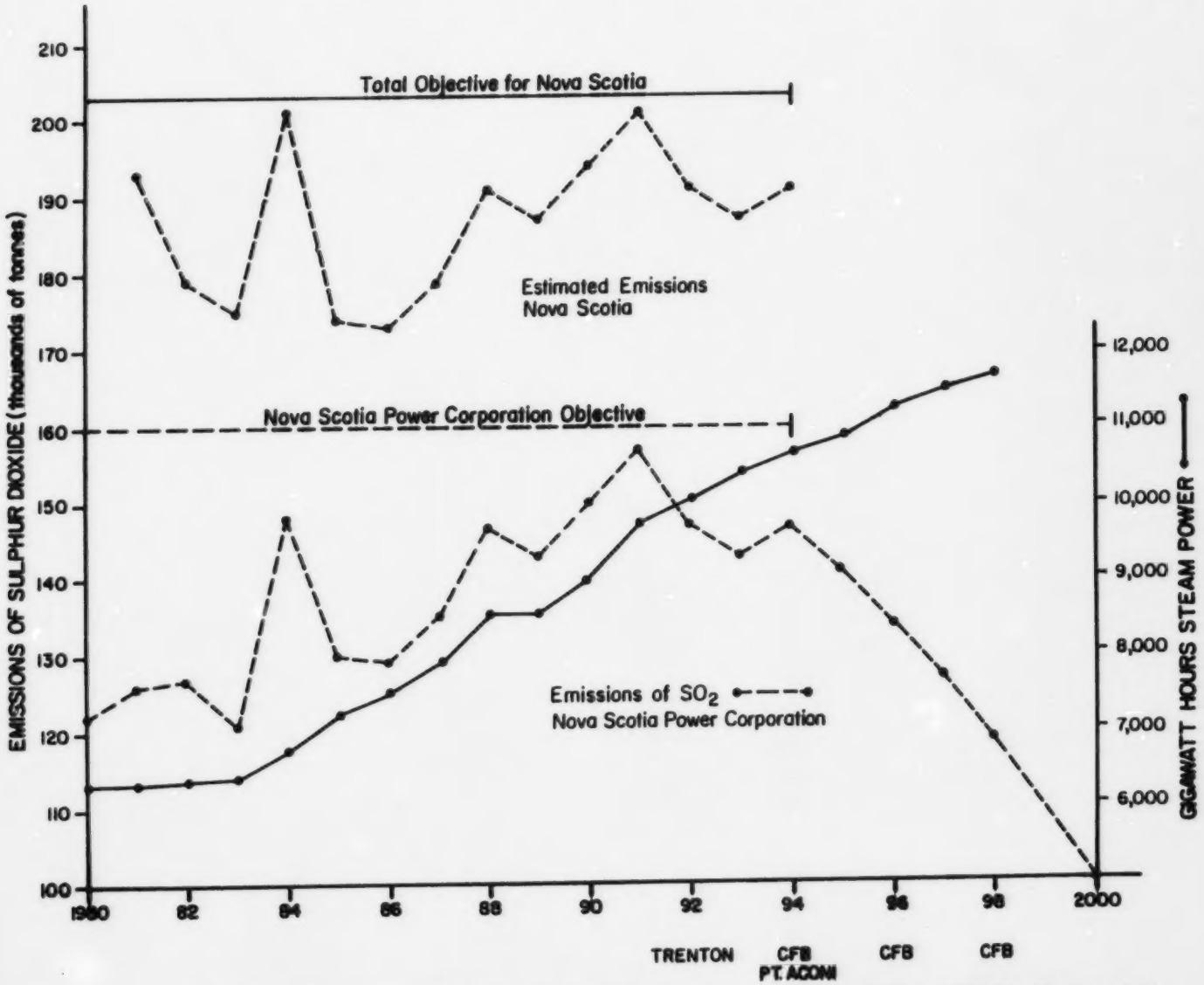


Figure I. Estimates of SO_2 emissions in Nova Scotia. New thermal units will be added to NSPC in 1992, 94, 96 and 1998.

NSPC is projected to emit about 100,000 tonnes of SO_2 despite the projected increase in their fossil fueled system to about, 12,000 GW.h of power. The numbers, based on reports by Mr. T. MacDonald, the Vice-President of Planning of the Nova Scotia Power Corporation, show that during a period when production capacity will increase by about 60%, SO_2 emissions per unit of production are almost halved. This will result from both burning low sulphur coal, and installation of fluidized bed combustion furnaces. Thus NSPC will attain its objective of 160,000 tonnes SO_2 by 1994.

Other industrial sources in the province are also being reviewed by the Nova Scotia Department of the Environment. Letters have been sent to each of the pulp and paper companies and oil refineries. Inventories on some of these industries have not been done for several years although their emissions will more likely have decreased rather than increased.

Since 1980, modernization programs at several pulp mills have permitted a switch from fuel oil to using waste wood as a fuel source, and in 1988, one of the smaller mills began to replace oil with coal/liquid mixtures. Further plans are being evaluated at some mills to replace sulphur containing chemical pulp manufacturing methods with mechanical grinding of wood into pulp. These programs have already resulted in reductions in sulphur emissions that collectively total about 5000 tonnes, and further reductions are anticipated. The industries have been requested to produce an emissions inventory for the calendar year 1989.

Deposition

The Nova Scotia Department of the Environment has operated a precipitation monitoring network since 1978. The network was designed to permit evaluation of a variety of substances in precipitation, including acids. Data from the network have been analyzed and it is clear that sulphate is the most abundant strong acid-forming substance in precipitation falling on the province. This is consistent with most of eastern Canada, and is one reason why the Canadian acid rain reduction program placed sulphur controls as the first order of business.

Deposition of wet Sulphate in Nova Scotia has not exceeded 20 kg/ha since the start of the decade. It has, however, frequently exceeded 15 kg/ha. This amount is considered the upper limit for highly sensitive waters.

Over 80% of the Province's lake areas are classified as highly sensitive since thin soils on granite and quartzite bedrocks offer very little protection against acidity. Researchers in the Department have concluded that 26% of the lake areas have, in fact, been acidified. A map released in June 1988 by the Conference of New England Governors and Eastern Canadian Premiers shows the extent of the highly sensitive waters in Nova Scotia. Copies of the Map are available from the Department of the Environment.

Figure 2 shows average sulphate deposition in Nova Scotia based on the weekly samples from the NSDOE network (Underwood et al. 1988). It also shows deposition at the federal station at Kejimkujik National Park in the southwestern portion of the province (courtesy P. Summers, Environment Canada, Downsview, Ontario). The similarity in data sets provides reassurance in the quality of the two sampling programs, and demonstrates that changes at one location are also seen at other locations. This reinforces conclusions in earlier papers that most acid rain in Nova Scotia results from sulphur emissions in other parts of the continent.

Average pH throughout the decade-long study was 4.6. It is the conclusion of researchers in the Department that damage in sensitive watersheds is therefore still continuing. This is a clear message that reductions in sulphur emissions must be secured throughout eastern North America, particularly in the United States, the source of at least 70% of the acid rain in Nova Scotia. Towards this end, Environment Minister John Leefe wrote to U.S. Secretary of State James Baker in February 1989 urging him to hasten the conclusion of a U.S./Canada Acid Rain Accord. Secretary Baker responded through his Assistant for International Environmental Affairs that "President Bush has called for a plan to reduce the emissions which cause acid rain and will soon be submitting a legislative proposal to put it into effect".

The Nova Scotia Department of the Environment contributes to two joint research projects with the Technical University of Nova Scotia, the University of Minnesota, and Dalhousie University. The projects are designed to evaluate

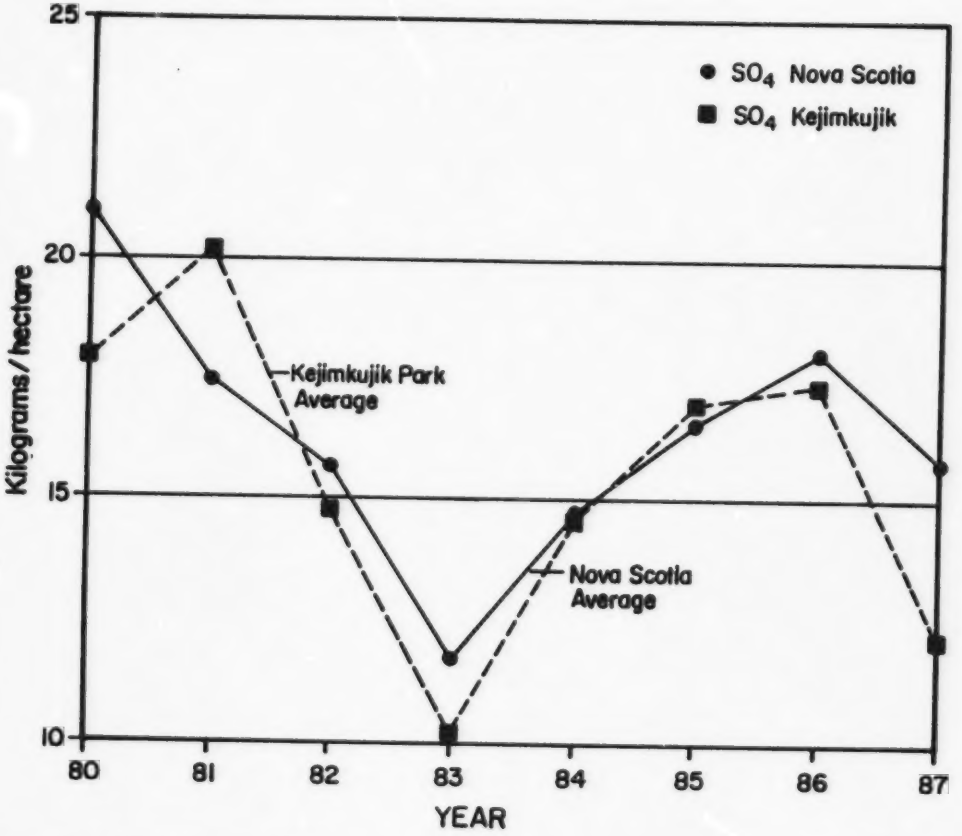


Figure 2. Sulphate deposition in Nova Scotia (5 NSDOE stations) and at Kejimkujik Park in south western Nova Scotia (1 Federal station).

the changes in water chemistry as precipitation falls through vegetation canopies and flows into head-water streams. These will aid in understanding how acid levels are changed by contact with plant communities which vary from mosses to hardwood trees. Results of these are expected to be available in March of 1990. The results will provide the government with guidance on watershed management practises, ranging from vegetation management in the forestry industry to requirements for and feasibility of liming water sheds to protect them from excessive loadings of acids. We acknowledge funding assistance of the Donner (Canada) Foundation and the Department of Supply and Services (through the Lands Service of Environment Canada) on these projects.

Initiatives/New Directions

In May of 1988 the Department of Environment hosted a visit from the Secretary of the Executive Office of Environmental Affairs from Massachusetts. While the Department has maintained close ties with the six New England states through the Conference of New England Governors and Eastern Canadian Premiers, this was the first time that the department has held unilateral meetings with a New England state on acid precipitation initiatives. Nova Scotia's Environment Minister held a joint press conference with Massachusets' Secretary James Hoyte, and hosted a reception during which leaders of industry and government discussed joint concerns and problems. Secretary Hoyte was also given an abridged tour of southwestern Nova Scotia where he saw first hand evidence of acid rain damage. The exercise was an effort to heighten awareness in the U.S. Administration of transboundary impacts of Acid Rain.

The "twinning exercise" was repeated in early June 1989 during International Air Pollution Week. Environment Minister John Leefe hosted a delegation from the State of Vermont who saw, first hand, acid rain damage to aquatic systems in Nova Scotia. They also learned of the province's commitment to control sulphur emissions in response to concerns about acid rain-causing emissions in Nova Scotia.

"The close working relationships that have been attained between environment departments of New England and Eastern Canada is a solid

accomplishment of the Conference of New England Governors and Eastern Canadian Premiers" said Mr. Leefe. "Surely the dedication shown by our officials must demonstrate to our respective federal governments that an international accord is both necessary, and attainable".

While progress in the United States is slow coming, there is reason for optimism in that President Bush has pledged that an acid rain program is a priority for his government. It is also noteworthy that the Senate majority leader is now Senator George Mitchell of Maine. Senator Mitchell, an ardent proponent of acid rain controls appreciates the vulnerability of his state to damage from acid rain. He has co-sponsored draft legislation in the U.S. Senate to cut emissions in the United States. He has also written to President Bush, urging quick action. He replaces Senator Robert Byrd from West Virginia who was unconvinced of the urgent necessity to legislate acid rain controls.

In the interim, the Nova Scotia Department of the Environment has initiated a small lake liming study in order to determine if acid buffering capacity can be provided for prolonged periods in lakes that have short water renewal rates. The lake, just on the outskirts of Halifax, received ten tonnes of limestone through the late-winter ice (March, 1989). It is scheduled to receive a further 20 tonnes of granulated limestone during the spring of 1989.

The study demonstrates Environment Minister John Leefe's continuing concern for the protection of aquatic environments in Nova Scotia against acid rain, and complements stream liming experiments he initiated while in his former portfolio as Fisheries Minister.

"Liming is not, and cannot be a replacement for effective acid rain controls in eastern North America," said Mr. Leefe. "It is an expensive prospect, requiring perhaps $10 million per year in this province to implement. It furthermore, is tantamount to the Government and the citizens of Nova Scotia paying for acid rain protection that should come from industries and corporations outside the boundaries of the province. This is an option we cannot condone".

The Nova Scotia Department of the Environment will, however, evaluate opportunities to work in a coordinated fashion with provincial and federal fisheries departments to protect special aquatic habitats. The Department will also study effective methods to assist selected acid stressed environments in their process of recovery once acid rain controls are applied to industries throughout the northeast.

It was noted above that Nova Scotia Power Corporation plans to incorporate an enhanced reduction program for SO_2. This resulted from a strong government initiative to further address emissions from NSPC stacks. The reduction directive, announced in the February 1989 Speech from the Throne, will focus both on new thermal units and on existing thermal units. The program is expected to cost several hundred millions of dollars.

Reductions at new thermal units will be accomplished first by building a unit to burn low sulphur coal, then by installation of fluidized bed combustion (F.B.C.) furnaces to supply increasing demands for electrical power beyond the turn-of-the-century (Figure 1). F.B.C. technology will permit the Corporation to capture over 90% of the sulphur in about one million tonnes of coal mined annually from the Prince Mine. This high sulphur coal, now blended with lower sulphur coals from other mines, will be channelled through state-of-the-art pollution control technology and well over 50,000 tonnes of SO_2 will be removed as a result.

In order to address emissions from existing thermal units, Nova Scotia Power Corporation is conducting research on effective and economically viable retrofitting with pollution reduction equipment. Injection of limestone powder with the pulverized coal is one approach that may offer some reductions. Limestone reacts chemically with SO_2 and removes it from exhaust gases.

Environment Minister Leefe has commented that "the commitment of the Province is expensive, but we can no longer afford the luxury of treating our environment as a disposable commodity". He added that, "we can all participate in an even stronger and more effective pollution abatement program. It can start with actions as effortless as turning back thermostats and redoubling a resolve to incorporate home energy conservation programs as part of an every-day pattern of living". There are estimates that energy saving of as much as 20% can result from these activities.

The Government of Nova Scotia has sent clear messages to Nova Scotians that preservation of our natural heritage is among its primary objectives. An example of this was the introduction of 'An Act to Protect the Ozone Layer from Further Damage' when the Nova Scotia legislature convened its spring session in February 1989. The Act will support the ever growing global initiative to ban, by the turn of the century, the chemicals that constitute this form of atmospheric pollution.

It is government's commitment to work jointly with both industry and the public to deal effectively with environmental issues in Nova Scotia. For this reason the Minister of the Environment was chosen to chair the Nova Scotia Round Table on Environment and the Economy. For this reason also, the government has announced that it will co-sponsor a conference with Voluntary Planning to examine how the concept of "sustainable development" can work to safeguard the environment of the province: not just the atmospheric environment, but all environments. The Conference, to be held in Halifax on October 16th and 17th 1989, is among the first of its kind in Canada. Mr. Leefe has commented that "industry and private organizations have almost matched, dollar for dollar, the funds that government has committed to this important initiative. This surely is a message that the environment of Nova Scotia has assumed a new value to us all".

The lessons learned during the development of the acid rain reduction agreements across the country have set the pattern for environmental activities of the future. The difficulties to be surmounted in solving the many other global atmospheric problems will magnify by many times the efforts required for solving the problem of acid rain. However, Canada is respected around the world for its leadership in providing solutions to these problems. Mr. Leefe is determined that Nova Scotia will be among the forerunners of this activity. "We are all part of it," he said, "we must all share the responsibility and work together to achieve solutions".

Reports/Publications Released During 1988

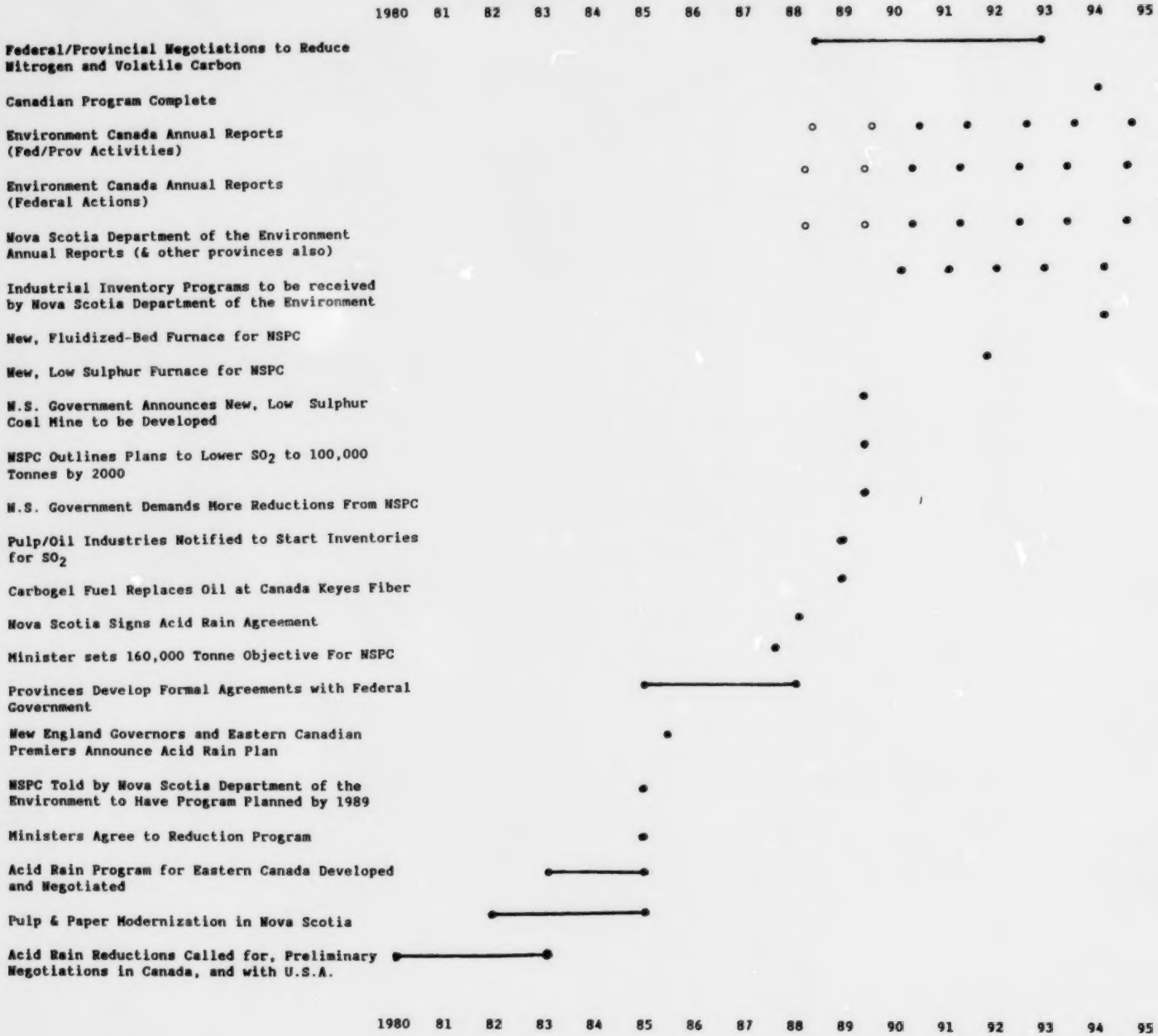
(1) Acid Rain and Watershed Sensitivity. An annotated map prepared for and published by the Conference of New England Governors and Eastern Canadian Premiers. June 1988.

(2) The Influence of the Ocean on the Chemistry of Precipitation in Nova Scotia. J.K. Underwood, D. H. Waller and D. Thirumurthi Atmosphere-Ocean 26(3), 467-479.

(3) Precipitation Chemistry in Nova Scotia: 1978-1987. J.K. Underwood, D.H. Waller and J.G. Ogden III. Nova Scotia Department of the Environment Technical Report.

(4) Canada/Nova Scotia Acid Rain Reduction Agreement. 1987-88 Annual Report of the Nova Scotia Department of the Environment. March 1989.

Appendix 1. Emissions Reduction Schedule and Program


1980 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
Federal/Provincial Negotiations to Reduce Nitrogen and Volatile Carbon
Canadian Program Complete
Environment Canada Annual Reports (Fed/Prov Activities)
Environment Canada Annual Reports (Federal Actions)
Nova Scotia Department of the Environment Annual Reports (& other provinces also)
Industrial Inventory Programs to be received by Nova Scotia Department of the Environment
New, Fluidized-Bed Furnace for NSPC
New, Low Sulphur Furnace for NSPC
N.S. Government Announces New, Low Sulphur Coal Mine to be Developed
NSPC Outlines Plans to Lower SO_2 to 100,000 Tonnes by 2000
N.S. Government Demands More Reductions From NSPC
Pulp/Oil Industries Notified to Start Inventories for SO_2
Carbogel Fuel Replaces Oil at Canada Keyes Fiber
Nova Scotia Signs Acid Rain Agreement
Minister sets 160,000 Tonne Objective For NSPC
Provinces Develop Formal Agreements with Federal Government
New England Governors and Eastern Canadian Premiers Announce Acid Rain Plan
NSPC Told by Nova Scotia Department of the Environment to Have Program Planned by 1989
Ministers Agree to Reduction Program
Acid Rain Program for Eastern Canada Developed and Negotiated
Pulp & Paper Modernization in Nova Scotia
Acid Rain Reductions Called for, Preliminary Negotiations in Canada, and with U.S.A.
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